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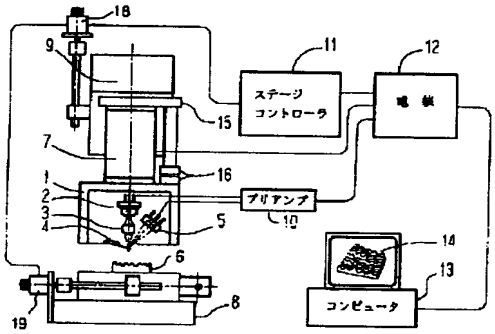
(54) **ATOMIC FORCE MICROSCOPE-TYPE SURFACE ROUGHNESS GAGE**

(57) Abstract:

PROBLEM TO BE SOLVED: To obtain a surface toughness gage whose high resolution is equal to that of an atomic force microscope or to obtain an atomic force microscope whose in-plane measuring range is very wide.

SOLUTION: In a surface roughness gage which observes the unevenness on the surface of a sample, a cantilever 4 at an atomic force microscope is used for a probe, a displacement detecting system which is constituted of a laser 2 which detects the displacement of the cantilver, of a lens 3 and of an optical detecting element 5 is installed, a piezoelectric element 7 which drives the cantilever is installed, and a displacement measuring means 16 which is used to measure the displacement amount of the piezoelectric element is installed. Thereby, it is possible to realize an apparatus whose measuring range is equal to that of an ordinary surface roughness gage and whose high resolution is equal to that of an atomic force microscope.



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(54) SCAN-TYPE TUNNEL MICROSCOPE AND SURFACE FORM OBSERVING METHOD THEREBY

(57) Abstract:

PURPOSE: To enable short time survey of a large area surface and survey of a high resistance surface portion by moving a probe at a constant speed close to the sample surface to detect a tunnel current, then after retracting it, moving it to the next survey point.

CONSTITUTION: A sample surface is divided into desired pixels, and when a pixel has been probed a probe 2 is retracted from that pixel and moved along a plane to the next pixel under control of a two-dimensional scan part 14. The tunnel current is detected by a current detection part 8 and compared with a signal from a goal current set circuit 9 by a comparator 10' and output to a tunnel region detection part 11. A probe control part 12 controls the motion of the probe 2 via DAC 25 and a high voltage amplifier 20 by utilizing a signal from a pulse generator 22 and a signal from the tunnel region detection part 11. The probe 2 is controlled to move close to the sample at a constant speed, and in case the sample surface has high resistance the probe 2 is retracted immediately and surface height information is obtained.